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PATENTSCHRIFT

— № 345813 —

KLASSE 14a GRUPPE 12

„Liebra" Motorengesellschaft m. b. H. in Wien.

Kolbenmaschine.

Patentiert im Deutschen Reiche vom 25. Juli 1917 ab.

Für diese Anmeldung ist gemäß dem Unionsvertrage vom 2. Juni 1911 die Priorität auf Grund der Anmeldungen in Österreich vom 1. August 1916 und 30. Januar 1917 beansprucht.

Es sind bereits Kolbenmaschinen bekannt, bei denen die Kolben von mehreren parallel zu einer Welle um diese herum angeordneten Zylindern oder Zylinderpaaren mit einer auf einer schiefen Kröpfung dieser Welle lose sitzenden Scheibe verbunden sind, wodurch je nach der Art der Maschine durch die motorische Hin- und Herbewegung der Kolben in entsprechender Aufeinanderfolge eine Taumelbewegung der Scheibe erzeugt wird, die die schräge Kurbelkröpfung der Welle und damit diese selbst in Drehung versetzt, oder umgekehrt ein drehender Antrieb der Welle die Taumelbewegung der Scheibe erzeugt, die ihrerseits die Zylinderkolben hin und her bewegt. In dem einen Falle kann die Maschine als Kraftmaschine, in dem anderen als Pumpe, Kompressor o. dgl. wirken.

Wird eine solche Maschine mit hohen Umlaufszahlen angetrieben, so entsteht durch die Massenwirkung der bewegten Teile das Bestreben, die ganze Maschine kreispendelartig

in Schwingungen zu versetzen. Dieses Bestreben kann nun gemäß der Erfindung in einfacher Weise dadurch beseitigt werden, daß man zwei Zylindersysteme der angegebenen Art, deren jedes also aus einer Anzahl von um die Welle herum angeordneten Zylinderpaaren besteht, mit je einer Scheibe zusammen arbeiten läßt, welche beiden Scheiben auf symmetrisch zueinander geneigten schrägen Kröpfungen einer durchgehenden Welle sitzen. Die beiden Zylindersysteme arbeiten also symmetrisch zueinander auf die gemeinschaftliche Welle, und die Massenwirkungen heben einander in jedem Augenblicke auf, so daß man nunmehr in der Lage ist, eine solche Verbundmaschine mit sehr großen Umlaufszahlen laufen zu lassen.

Für Maschinen der bekannten Art wurde auch bereits vorgeschlagen, die zu beiden Seiten der auf der schrägen Wellenkröpfung sitzenden Scheibe befindlichen Zylinder gegeneinander zu versetzen, um die Stetigkeit des Antriebes zu erhöhen. Dies hat aber den Nachteil, daß dann keine Paare einander gegenüberliegender Zylinder mehr vorhanden sind, deren Kolben durch je eine Kolbenstange miteinander verbunden und diese gemeinsamen Kolbenstangen durch die Kolben selbst geradegeführt wären. Bei Anwendung von zwei Zylindersystemen, wie eben geschildert, läßt sich aber dieses Prinzip ohne weiteres verwirklichen, indem nämlich die Zylinder des einen Systems gegenüber denen des anderen Systems um den halben Winkelabstand zwischen zwei benachbarten Zylindern versetzt werden, so daß also die Stetigkeit des Antriebes auf die von beiden Zylindersystemen gemeinschaftlich angetriebene Welle erhöht wird, ohne daß hierbei die erwähnte Aufhebung der Massenwirkung in einem praktisch in Betracht kommenden Maß leiden würde.

Die Zeichnung zeigt in Abb. 1 schematisch eine Ausführungsform einer Maschine nach der vorliegenden Erfindung in einem Achsialschnitt und in Abb. 2 eine Stirnansicht der Zylinder.

Die Abb. 3 zeigt die Stirnansicht der Zylinder bei gegenseitiger Versetzung der Zylinder der beiden Maschinensysteme.

Bei jeder der beiden Maschinensysteme I, II ist an jeder Hälfte des zweiteiligen Kurbelgehäuses eines der Lager der Welle *a* sowie eine Anzahl von um diese herum in gleichen Abständen verteilten Zylinderpaaren *m* angeordnet, die mit den Kurbelgehäusehälften aus einem Stück bestehen können. Die beiden Systemen I, II gemeinsame Welle *a* besitzt für jedes System eine schiefe Kröpfung *b*, auf der eine Scheibe *c* lose gelagert ist, welche Scheibe an ihrem Umfange eine Anzahl von radial geführten Gleitstücken *p* trägt. Diese Gleitstücke *p* fassen die die gleichlaufenden Kolben zweier gegenüberliegender Zylinder *m* verbindenden Kolbenstangen *n* an. Die beiden Kröpfungen *b* der Welle *a* sind zueinander symmetrisch.

Das Zylindersystem I arbeitet dem Zylindersystem II entgegen, so daß also die Massenwirkungen der beiden Maschinenteile einander gegenseitig aufheben.

Die Abb. 2 zeigt in schematischer Darstellung die Austeilung der Zylinderpaare *m* im Kreise um die Welle *a* herum, also hier beispielsweise acht in gleichen Abständen voneinander entfernte Zylinderpaare. Die Zylinderpaare beider Maschinenteile sind dabei in gleicher Weise um die Welle *a* herum angeordnet, so daß also in der Achse jedes Zylinderpaars des einen Maschinenteiles auch ein Zylinderpaar des anderen Maschinenteiles liegt. Man kann aber auch, wie aus Abb. 3 ersichtlich, die Zylinderpaare des einen Maschinenteiles gegenüber denen des anderen um den halben Winkelabstand zweier benachbarter Zylinderpaare gegeneinander versetzen. (Die voll ausgezogenen Kreise zeigen die Zylinderpaare des einen Maschinenteiles in Stirnansicht und die gestrichelten Kreise die Zylinderpaare des anderen Maschinenteiles.) Diese gegenseitige Versetzung der Zylinderpaare hat den Vorteil, daß die Stetigkeit des Antriebes der gemeinschaftlichen Welle *a* erhöht wird, indem die Impulse des einen Maschinenteiles in den Zwischenräumen der Impulse des anderen Maschinenteiles auftreten. Der Ausgleich der Massenwirkungen wird hierdurch, praktisch genommen, nicht beeinträchtigt.

Patent-Ansprüche:

1. Kolbenmaschine, bei der die Kolben einer Anzahl von um eine Welle herum parallel zu dieser fest abgeordneten Zylinderpaaren mit einer auf einer schiefen Kröpfung dieser Welle lose sitzenden Scheibe verbunden sind, dadurch gekennzeichnet, daß zwei Systeme von Zylinderpaaren auf zwei Scheiben einwirken, die auf zueinander symmetrischen schiefen Kröpfungen einer gemeinschaftlichen Welle sitzen, um eine Ausgleichung der Massenwirkungen der beiden Systeme zu erhalten.

2. Kolbenmaschine nach Anspruch 1, dadurch gekennzeichnet, daß die beiden Zylindersysteme um den halben Winkelabstand zweier benachbarter Paare gegeneinander versetzt sind, um die Stetigkeit der Kraftübertragung zu erhöhen.

Hierzu 1 Blatt Zeichnungen.

BERLIN. GEDRUCKT IN DER REICHSDRUCKEREI.

Zu der [redacted]ntschrift 345813
Kl. 14a Gr. 12

Abb. 1.

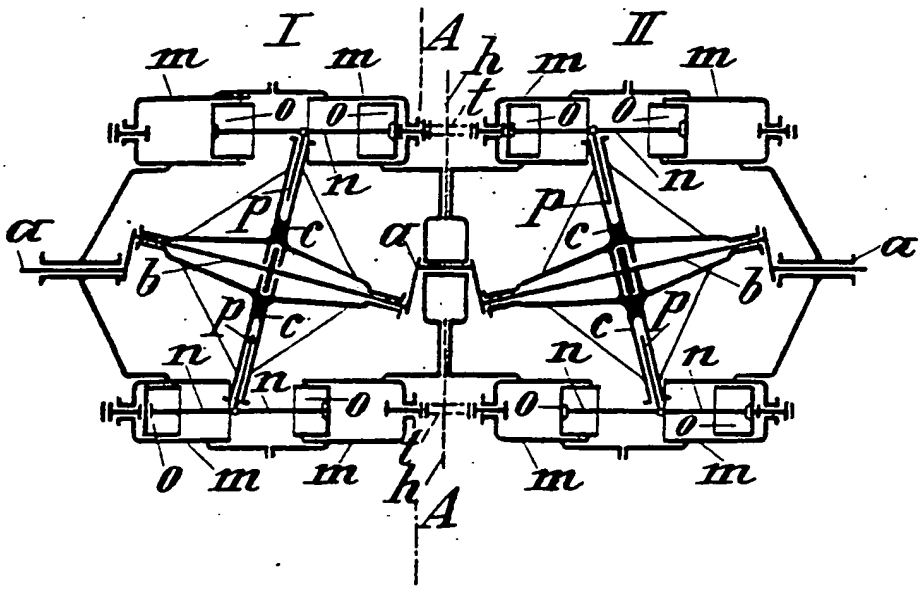


Abb. 2.

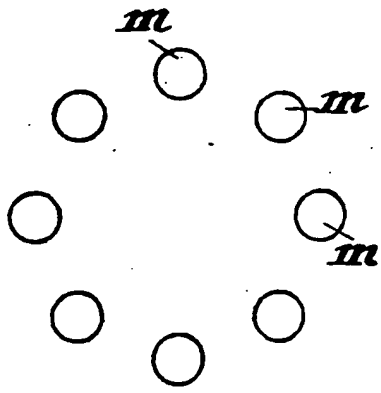
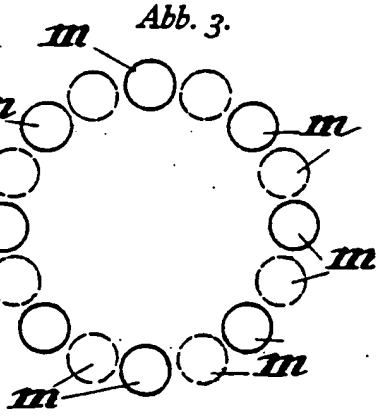


Abb. 3.



PHOTOGR. DRUCK DER REICHSDRUCKEREI

GERMAN REICH

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[Crest] DECEMBER 20, 1921

REICH PATENT OFFICE

PATENT

No. 345813

Class 14a GROUP 12

"Liebra" Motorengesellschaft m.b.H., Vienna

Piston engine.

Patented in the German Reich effective July 25, 1917.

Pursuant to the Union Treaty of June 2, 1911, priority is claimed for this patent on the basis of the applications filed in Austria on August 1, 1916, and January 30, 1917.

Piston engines are known in which the pistons are connected, by a plurality of cylinders or cylinder pairs disposed parallel to a shaft and therearound to a disk movably seated on an oblique throw of said shaft, whereby, depending on the type of engine, the propulsive reciprocating movement of the pistons produces in corresponding sequence a wobbling motion of the disk, which sets the slanted crank throw of the shaft and thus the shaft itself in rotation, or, conversely, a rotary propulsion of the shaft produces the wobbling motion of the disk, which in turn moves the cylinder pistons back and forth. In the one case, the engine can act as a prime mover, and in the other, as a pump, compressor, or the like.

If such an engine is driven at a high number of rotations per minute, the mass effect of the moving parts will give the engine as a whole a tendency to oscillate in a circular pendulum motion. This tendency can now be eliminated in a simple manner according to the invention in that two cylinder systems of the aforesaid type, each thus consisting of a number of cylinder pairs disposed about the shaft, are each made to cooperate with one disk, which two disks are seated on oblique throws of a continuous shaft that are tilted symmetrically toward each other. The two cylinder systems therefore operate in mutual symmetry on the common shaft; and the mass effects cancel each other out at all times, so that such a compound engine can henceforth be operated at very high rotations per minute.

For engines of the known species, it has previously been proposed that the cylinders on both sides of the disk seated on the slanted crankshaft throw be offset with respect to one another in order to increase the steadiness of the propulsion. However, this has the disadvantage that there are no longer pairs of mutually opposite cylinders whose pistons are interconnected by a piston rod for each pair, these common piston rods being guided in a straight line by the pistons themselves. However, with the use of two systems of cylinders, as described hereinabove, this principle can readily be implemented by offsetting the cylinders of the one system with respect to those of the other system by half the angular distance between two adjacent cylinders, thereby increasing the

steadiness of propulsion on the shaft driven jointly by the two cylinder systems without detracting in any practically significant manner from the aforesaid cancelling of the mass effect.

In the drawing, Fig. 1 is a schematic depiction of an embodiment of an engine according to the present invention in axial section and Fig. 2 is a front view of the cylinders.

Figure 3 shows the front view of the cylinders with the cylinders of the two engine systems offset with respect to one another.

In each of the two engine systems I, II, disposed on each half of the two-part crankcase is one of the bearings of the shaft *a* and a number of cylinder pairs *m* which are distributed evenly spaced therearound and which can be of one piece with the halves of the crankcase. The shaft *a* common to both systems I, II comprises for each system an oblique throw *b* on which is movably mounted a disk *c* which carries at its periphery a number of radially guided sliders *p*. Said sliders *p* grasp piston rods *n* connecting the pistons, moving in the same direction, of two opposite cylinders *m*. The two throws *b* of the shaft *a* are mutually symmetrical.

Cylinder system I works in opposition to cylinder system II, so that the mass effects of the two engine parts cancel each other out.

Figure 2 is a schematic representation of the distribution of the cylinder pairs *m* in a circle about the shaft *a*, i.e., here, for example, eight cylinder pairs disposed equidistantly from one another. The cylinder pairs of both engine parts are disposed in the same manner about the shaft *a*, so that within the axis of each cylinder pair of the one engine part there is disposed a cylinder pair of the other engine part as well. However, as is evident from Fig. 3, the cylinder pairs of the one engine part can also be offset with respect to those of the other by one-half the angular distance between two adjacent cylinder pairs. (The unbroken circles represent the cylinder pairs of the one engine part in front view and the dashed circles the cylinder pairs of the other engine part.) Offsetting the cylinder pairs with respect to one another has the advantage of increasing the steadiness of propulsion of the common shaft *a*, since the impulses of the one engine part occur in

the intervals between the impulses of the other engine part. The balancing of the mass effects is not impaired by this to any practical extent.

CLAIMS

1. A piston engine wherein the pistons of a number of cylinder pairs fixedly disposed about a shaft and parallel thereto are connected to a disk movably seated on an oblique throw of said shaft, characterized in that two systems of cylinder pairs act on two disks seated on mutually symmetrical oblique throws of a common shaft to balance the mass effects of the two systems.

2. A piston engine according to Claim 1, characterized in that the two cylinder systems are offset with respect to each other by one-half the angular distance between two adjacent pairs in order to increase the steadiness of power transmission.

1 sheet of drawings appended

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TO: Linda Vega
Secretary to Phyllis Kristal
FISH & RICHARDSON, P.C.
617-542-8906

FROM: Michele Phillips

Please find attached the English translation of your German patent. I will be sending the hardcopy and invoice out to you tonight by regular mail.

Please don't hesitate to contact me if you have any questions. It is our pleasure to be of service to you. Have a great afternoon!

Sincerely,

Michele Phillips

Michele Phillips

599 North Avenue, Door 9 • Wakefield, MA 01880
Email: michele@transtekusa.com

GERMAN REICH

[Stamp:]

ISSUED

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If such an engine is driven at a high number of rotations per minute, the mass effect of the moving parts will give the engine as a whole a tendency to oscillate in a circular pendulum motion. This tendency can now be eliminated in a simple manner according to the invention in that two cylinder systems of the aforesaid type, each thus consisting of a number of cylinder pairs disposed about the shaft, are each made to cooperate with one disk, which two disks are seated on oblique throws of a continuous shaft that are tilted symmetrically toward each other. The two cylinder systems therefore operate in mutual symmetry on the common shaft; and the mass effects cancel each other out at all times, so that such a compound engine can henceforth be operated at very high rotations per minute.

For engines of the known species, it has previously been proposed that the cylinders on both sides of the disk seated on the slanted crankshaft throw be offset with respect to one another in order to increase the steadiness of the propulsion. However, this has the disadvantage that there are no longer pairs of mutually opposite cylinders whose pistons are interconnected by a piston rod for each pair, these common piston rods being guided in a straight line by the pistons themselves. However, with the use of two systems of cylinders, as described hereinabove, this principle can readily be implemented by offsetting the cylinders of the one system with respect to those of the other system by half the angular distance between two adjacent cylinders, thereby increasing the

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For Patent 345813

Cl. 14a Gr 12

Fig. 1

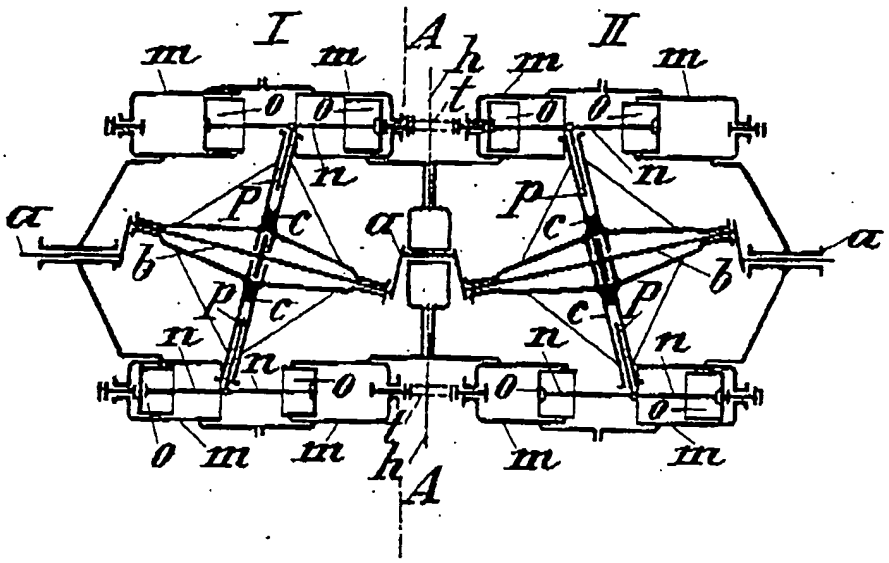

Fig. 2

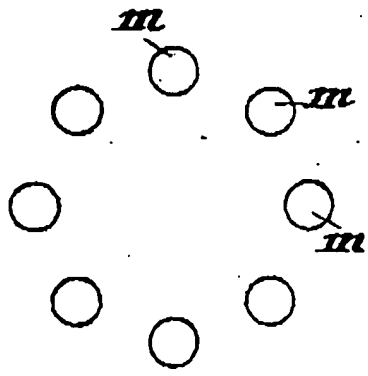

Fig. 3